Price Effects of the ASEAN-China Free Trade Area

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Abstract

Free trade agreements (FTAs) influence the incentive structure of exporters, who make pricing decisions based on profit maximization within the constraints of competition. The outcomes of FTAs tend to be heterogeneous, and decomposing their price effects into distinct mechanisms based on these incentives can help explain why they have asymmetric impacts on different economic agents. This paper studies the effect of FTAs on pre-tariff prices through the mechanisms of incomplete tariff pass through and price competition. An empirical case study of the ASEAN-China Free Trade Area (ACFTA) enables the identification of both mechanisms by exploiting differences in treatment across countries and commodities. Incomplete tariff pass-through increased pre-tariff prices among member countries, while price competition exerted downward pressure on pre-tariff prices in both member and non-member countries. These price effects matter in a number of policy debates, particularly between regionalism and multilateralism. More concrete links must be established between price effects and their overarching implications on policy so we can fully appreciate the complexities of FTAs.

Section I: Introduction

The region of Southeast Asia is hot and humid all year round, creating the ideal conditions for cultivation of tropical fruit. China, on the other hand, produces mainly fruit from temperate and subtropical climates, and must import most tropical fruit from Southeast Asia. Demand for guavas, mangos and mangosteens was so high that in 2005, countries in ASEAN-5[1] exported nearly US$17.5 million of these fruits to China alone. In 2002, an Indonesian farmer would earn an average pre-tariff price of 40 cents per kilogram of guavas, mangos and mangosteens.[2] By 2005, the same farmer would earn 63 cents per kilogram, a hefty 50% increase in revenues. A similar trend was also observed by other countries in ASEAN-5.

It is no coincidence that significant growth in export prices occurred after the implementation of ASEAN's first trade agreement with China. In December 2002, ASEAN negotiated reciprocal tariff reductions on a significant number of agricultural commodities under the Early Harvest Program (EHP), which represented a first step towards the establishment of an ASEAN-China Free Trade Area (ACFTA). The Philippines was the only country in ASEAN that did not reach agreement with China on the terms of EHP, and as such, chose not to participate in the initial phase of tariff reductions. In 2002, Philippine farmers were also selling guavas, mangos and mangosteens at the same pre-tariff price of 40 cents a kilogram. Unlike Indonesia, however, prices had fallen to 31 cents by 2005.[3]

This observation raises two questions. Why did Indonesian farmers raise prices in response to tariff reductions? Why did Philippine farmers lower prices even though their tariffs remain unchanged? This paper hypothesizes that incomplete tariff pass-through explains the first puzzle, while price competition explains the second. Incomplete tariff pass-through occurs when exporters absorb part of tariff savings by marking up pre-tariff prices, so as to maximize profit. Price

[1] The Association of Southeast Asian Nations (ASEAN) is a political and economic organization comprising of 10 countries in Southeast Asia. ASEAN-5 refers to five founding members of the organization, namely Indonesia, Malaysia, Philippines, Singapore and Thailand.

[2] Based on author's calculations using export data from the UN Commodities Trade database. The total trade value and quantities of mangos, guavas and mangosteens are reported by exporting countries under the classification HS-080450. Price data was obtained by dividing total trade value by total quantity.

[3] Based on author's calculations using data from the UN Commodities Trade database. See footnote 2 for methodolody.

competition occurs when export prices fall as a result of tariff reductions, and others are forced to also lower their prices in order to remain competitive.

Mounting pressure on the Philippine government to join the EHP eventually led to their capitulation and abolishment of tariffs on EHP commodities beginning in 2006. However, the interim period between 2002 and 2005 still provides us with a very interesting case study though which we can test the predictions that economists have put forth regarding the effects of free trade agreements on export prices. Furthermore, it provides us with the opportunity to apply these theories in a context that has yet to be extensively studied. Although similar papers have examined the effects of other free trade agreements such as MERCOSUR, they focus on either overall trade volumes and post-tariff prices, or consider the effects of incomplete tariff pass through and price competition in isolation. ACFTA allows us to examine the more complex but realistic scenario where both price effects occur simultaneously. This provides corroborating evidence for existing literature on the incomplete tariff pass-through and price competition effects.

Why should we be interested in studying ACFTA? First, free trade areas have become far more widespread today relative to three decades ago. There are currently 267 regional physical trade agreements in force, which represent reciprocal trade agreements between two or more trade partners.[4] Of these, 48 are regional trade agreements that involve three or more negotiating parties, in which one or more parties may represent an existing regional trade bloc. The increasing number of regional trade agreements in the pipeline today reflects the growing capacity of countries to conduct complex negotiations where interests are at stake, which also creates more opportunities for cooperation. Second, the proliferation of free trade areas has been a concern for policy makers who believe that the rise of regionalism has come at the expense of multilateralism under the WTO, especially in the wake of stalled negotiations since the Doha Round in 2008. In view of the increasing popularity of regional FTAs and the controversies that accompany them, it is both interesting and relevant to understand their consequences for participants.

[4] Figures as of February 2006, based on data from the WTO. A complete list of RTAs (notified and in force) can be accessed from the WTO RTA database at http://rtais.wto.org/UI/PublicAllRTAList.aspx.

Even if we were interested in studying FTAs, why should we look at price effects in particular? There are indeed many broader questions we can ask about the effects of FTA that may seem more relevant to current policy debates. For instance, do multilateral free trade agreements impede meaningful progress by diverting attention and resources away from the WTO (Hufbauer and Wong, 2005), or are they more disruptive than bilateral trade agreements? These questions cannot be fully addressed by simply looking the price effects of FTAs. Yet, it is also difficult to understand these issues without considering how FTAs directly and indirectly affect prices of exports. By studying the mechanisms of incomplete tariff pass through and price competition, we can form stronger hypotheses addressing broader policy questions related to FTAs.

This thesis has two main objectives. First, it examines how the establishment of ACFTA has affected Southeast Asia, as well as the consequences of the Philippines' initial rejection of the Early Harvest Program. I investigate how pre-tariff export prices were affected in countries and commodities that experienced tariff reductions, relative to non-affected control groups. Next, I test the hypotheses that the overall price effects of ACFTA can be decomposed into price competition and incomplete tariff pass through. This approach exploits further differences within the treatment group, by comparing monopoly exports and non-monopoly exports.

By comparing pre-ACFTA and post-ACFTA export prices of various treatment and control groups, this thesis arrives at three main findings. First, member countries experienced an increase in the relative prices of exports that experienced tariff reductions under the EHP, and while non-member countries experienced a decline. This result provides evidence that FTAs have an overall impact on pre-tariff prices. Second, prices of EHP commodities for which the exporting country was a monopoly producer experienced a greater increase in prices, relative to non-monopoly EHP commodities. This finding supports the price competition hypothesis. Third, prices of monopoly EHP products that experienced a tariff reduction also saw a greater increase in prices compared to monopoly EHP products that were already at zero tariffs prior to ACFTA. This result is in line with the incomplete tariff pass-through hypothesis.

In summary, this thesis provides corroborating evidence for the mechanisms of incomplete tariff pass through and price competition. It concludes that both effects not only exist independently

of one another, but they can also occur simultaneously in member countries. Since these mechanisms work in opposite directions, they can therefore result in differential outcomes across different countries and commodities.

Section II: Literature Review

There is extensive literature on the impact of FTA accession, but many researchers have focused on the economic outcomes for new members joining these trade agreements. Furthermore, these papers focus on import or export value growth rather than changes in prices, as a means of investigating overall trade creation and diversion. The effects of Poland's accession to the EU beginning in 1991 have been studied by Milner and Sledziewska (2008), who modeled trade at the commodity level to capture the *ex post* effect of tariff reductions on Polish import growth on trade creation and trade diversion. They found that the European Agreement had transitory but significant impacts on import growth between 1996 and 2002, estimated at US$4.3 billion. Furthermore, trade creation effects consistently outweighed trade diversion during the same period, although both effects taper off by 1999. Babetskaia-Kukharchuk and Maurel (2004) wrote a similar paper supporting Russia's bid for WTO membership. By applying the gravity framework to a panel data set of 42 countries, the authors estimate Russia's pre-accession losses from trade diversion, and predict Russia's integration into the WTO will lead to progression elimination of these losses. The authors of both papers focus on overall trade volume effects, but further investigating the impact of tariff reductions on pre-tariff prices will provide us a more complete understanding of the welfare effects for both countries.

Research examining the impact of FTA expansion on member states is limited, and in addition, they tend to focus on broader effects such as foreign direct investment or patterns of industrial specialization. Ianchovichina and Walmsley (2005) use a dynamic general equilibrium model based on the Global Trade Analysis Project (GTAP) database to predict the effect of China's WTO accession on countries in East Asia, including Singapore, Thailand, Philippines, Malaysia and Indonesia, focusing on 18 major export industries including agriculture, electronics, textiles and apparel. The authors estimated that while Japan, Taiwan and Korea would stand to benefit from China's WTO accession, all Southeast Asian countries would experience welfare losses ranging from US$14 million in the case of Malaysia, to as much as US$146 million in the case of Singapore. However, the welfare analysis focused on cumulative volume changes in terms of output and exports, attributing it to increased foreign investment in capital-intensive sectors and the changes

in China's demand for production inputs. It did not examine the potential price effects of China's WTO accession. Furthermore, the paper did not take into account China's participation in ACFTA, which led to greater preferential tariff margins for ASEAN. As such, it is valuable to reconsider their findings in light of this development.

Studies on the impact of ACFTA have produced mixed verdicts, and there is still controversy about whether it has been a bane or boon for ASEAN. To address this question, Tongzon (2005) constructed a revealed comparative advantage index (RCAI) comprising of the top 10 exports for each country in 2000, and combined it with an analysis of their labor force structures, labor productivity, total factor productivity and technology diffusion. Using this information, he predicts which export sectors are most likely benefit from ACFTA (food, mineral and petroleum products, timber, metals, chemicals, plastics), as well as which sectors will come under most pressure from China (cotton, apparel, footwear, miscellaneous manufactures). This indicates that depending on their export specializations, countries in ASEAN would benefit unequally from ACFTA. Other scholars have focused on measuring competitiveness and regional economic integration, but few studies have actually considered the impact of ACFTA on prices, and to my knowledge, none have evaluated pre-tariff prices in particular. As such, it is useful to supplement their findings by applying the methodologies developed in previous literature to the case study of ACFTA.

Most literature written about the effects of tariff reductions have focused on changes in post-tariff prices. An empirical study by Kreinin (1961) was the first to demonstrate that post-war tariff concessions in the US caused a decline in export prices. Subsequent studies have investigated the mechanism through which these price effects occur. In his "symmetry" hypothesis, Feenstra (1989) conducted a study of US imports of Japanese trucks and found that changes in tariff rates have similar effects on prices as exchange rate shocks on final prices of goods. This is empirically observed in how post-tariff prices do not fluctuate as much as changes in tariffs (i.e. not a one-to-one relationship). He found that incomplete pass-through from tariff reductions or positive exchange rate shocks occur because profit-maximizing firms increase their prices slightly if demand elasticity is less than one. However, this model only takes into account the competition between local and imported varieties of goods, but does not account for competition between different

imported varieties. Goldberg (1995) addresses this shortfall by using the Bertrand competition framework to study the effects of exchange rate pass-through on the US automobile industry.

Chang and Winters (2002) further explore another mechanism through which FTAs can lead to changes in pre-tariff export prices. They model price competition between rival exporters, in which a tariff reduction enjoyed by member countries of an FTA could pressure exporters in non-member countries to lower their prices in order to remain competitive. Using the case study of Argentina, Brazil and MECOSUR, the authors demonstrate that preferential tariff reductions in MERCOSUR caused a significant decrease in pre-tariff export prices of exporters from all nonmember countries including the US, Japan and Germany. Since this study was limited to goods that were produced in Argentina and exported to Brazil (which constitutes only 38% of total export categories in 1991), Schiff and Chang (2003) further extended the analysis by looking at prices of commodities that were exported by Argentina to Brazil, relative to commodities that were not. Since commodities that were not exported by Argentina do not undergo price competition post-MERCOSUR, Schiff and Chang found that there was no significant change in the prices of these exports from non-member firms. In contrast, the authors estimated a significant terms-of-trade loss for non-member firms exporting the same commodities as Argentina, for which the negative price effect was approximately 40% of the change in preferential tariffs. However, the limitation of both papers is their common focus on the distinction between member vs. non-member countries, which overlooks the possibility that both price effects could occur simultaneously.

In summary, this paper contributes to existing literature by distinguishing itself in the following four areas: (1) Focusing on price effects instead of quantity or volume effects; (2) Examining changes in pre-tariff rather than post-tariff price changes; (3) Accounting for the scenario where incomplete tariff pass through and price competition occur simultaneously; (4) Applying the theoretical predictions of past research to the novel context of ASEAN, in order to supplement existing literature on MERCOSUR, NAFTA and the EU.

The findings of current literature demonstrate that the incomplete tariff pass-through and price competition effects work in opposite directions, which generates interesting predictions about the effect of FTAs on pre-tariff prices. By adapting the methodologies developed by other

scholars and testing their theories in the context of ACFTA, this case study will provide a platform through which we can broaden our understanding of price effects.

Section III: Overview of the ASEAN-China Free Trade Area

The Association of Southeast Asian Nations (ASEAN) was founded in August 1967, with the mission of facilitating economic growth, social progress and cultural cooperation. In the early years after the organization's founding, ASEAN focused on negotiating political accords to maintain regional stability in the midst of national security threats stemming from communist insurgencies and territorial disputes. Subsequently, the organization's focus shifted to cooperation on economic issues, with the aim of bringing together the fragmented markets of Southeast Asia and eventually creating a single market for goods, services, capital and labor. The ASEAN Free Trade Area (AFTA) came into force in 1992, under which tariff rates between its members were negotiated under the Common Effective Preferential Tariff (CEPT) Scheme. As of January 2002, CEPT tariffs on 96.24% of product categories under the Inclusion List (which constitutes 98.36% of all tariff lines) had been reduced to no more than 5% for Brunei, Indonesia, Malaysia, Singapore, Philippines and Thailand.[5]

By the turn of the millennium, leaders in ASEAN became cognizant of China's rising influence and economic presence in the region. Between 1996 and 2001, China's share in ASEAN's export market tripled from 2.3% to 6.9% in just a span of five years (Bernadino, 2004). At the same time, ASEAN's share of China's foreign merchandise trade had grown also steadily from 5.8% in 1991 to 8.3% in 2000 (Tongzon, 2005). ASEAN therefore increased its efforts to engage China with the aim of tapping into Asia's largest market and accelerating export growth. This was especially critical in the wake of the 1997 Asian Financial Crisis that had crippled the economies of Thailand and Indonesia. The foundations of ACFTA were first laid out during discussions at the 1999 ASEAN-Plus-China Summit in Manila. A year later, an expert group was commissioned during the Singapore Summit to study the feasibility of ACFTA. Negotiations were officially announced at the 2001 Brunei Summit, and in 2002, China and ASEAN signed the Framework Agreement on Comprehensive Economic Co-Operation. This agreement pledged to facilitate economic cooperation, and it included plans to implement an ASEAN-China Free Trade Area (ACFTA) for goods and services. This effectively represented the accession of China to AFTA, where it would be accorded the same tariff

[5] Based on the Joint Press Statement published by the ASEAN Secretariat after the 16th Meeting of the AFTA Council on 11 September 2002 in Brunei, full text available at http://www.asean.org/?static_post=the-sixteenth-meeting-of-the-asean-free-trade-area-afta-council-11-september-2002-bandar-seri-begawan-brunei-darussalam

treatment as other member states in the region. The market created after China's accession would have a population of 1.7 billion inhabitants, a combined GDP exceeding US$2 trillion and total trade volume amounting to US$1.23 trillion (Cai, 2003).

The implementation of ACFTA was designed to take place over a period of two decades, with specific timelines for tariff elimination depending on product categories, which are classified under the "Early Harvest", "Normal" and "Sensitive" tracks. The Early Harvest Program (EHP), described in Article 6 of the Framework Agreement, required that some agricultural commodities undergo complete tariff elimination by January 2006.[6] The purpose of the EHP was to create momentum for the negotiation process as well as to produce immediate benefits and positive results which would provide further support for ACFTA (Chin and Stubbs, 2011). The EHP tariff schedule is presented in Figure 1 below, in which the rate of tariff reduction depends on the initial tariff level in 2002.[7] During this period, tariff reductions on non-EHP products were determined in accordance with a more conservative timeline that was negotiated between China and the members of the WTO.

Figure 1: Schedule for EHP implementation, applicable to ASEAN-6

Target tariff rate (no later than date specified)

January 2004	January 2005	January 2006

[6] Countries are allowed a very limited number of exceptions that are negotiated under their respective Exclusion Lists, but none of the ASEAN-5 countries who participated in the EHP exercised this option in negotiations with China. See Appendix 2 (Annex 1) of the 2003 *Protocol to Amend the Framework Agreement*, available at http://www.asean.org/storage/images/2013/economic/afta/ACFTA/5-Protocol%201%20-%20Appendix%202.pdf

[7] The rate of tariff reduction may be different across countries, as the timeline only sets a cap on tariff rates, and targets may have been achieved more quickly in some countries than in others. For example, Thailand signed a separate agreement with China in 2003 to completely eliminate tariffs on EHP exports by 2003 instead of 2006. However, this does not fundamentally alter the hypotheses, which looks at static effects rather than dynamic price effects.

2002 MFN tariff rate[8]				
	> 15%	10%	5%	0%
	5% - 15%	5%	0%	0%
	< 5%	0%	0%	0%

Source: Framework Agreement on Comprehensive Economic Co-operation, 2002

Thailand and Singapore were strong supporters of ACFTA, due to the favorable bilateral relations and economic ties that the two countries enjoyed with China even before the establishment of AFTA. Premier Li Peng had announced China's intentions to develop relations with ASEAN during his visit to Thailand in 1988, and China intensified its efforts to promote cooperation with ASEAN after establishing official diplomatic ties with Singapore in 1990. On the other hand, responses from Indonesia and the Philippines were lukewarm, and the push to establish ACFTA was met with domestic resistance (Chin and Stubbs, 2011). Among other reasons, Indonesian farmers were wary of extensive domestic subsidies that the Chinese government provided to local farmers, which they believed created unfair competition. As such, the Indonesian government has repeatedly come under pressure to renegotiate the terms of ACFTA.

Due to stalled negotiations with China, the Philippines did not join the Early Harvest Program in 2002 and was excluded from the tariff reductions that China applied to other members of ASEAN. This was because of strong lobbying by interest groups, particularly the producers of sugar, pork, poultry, rice, corn and vegetables, which were sensitive industries affected by the EHP (Balboa and Medella, 2007). Although tariff rates on exports to China did decrease slightly between 2002 and 2005 due to China's commitments under the WTO, these tariff reductions were very modest compared to other members of ASEAN. In 2005, the Philippines finally negotiated a package with China that was acceptable to domestic interest groups. Mutual tariff eliminations on EHP exports took effect in 2006 after President Macapagal issued Executive Order No. 485 in December 2005.

[8] In 2002, Indonesia, Malaysia, Philippines, Singapore and Thailand were subject to the same tariff treatment because none of these countries were Preference Beneficiaries of China under the WTO framework.

This thesis uses a two-period panel data comparing pre-tariff export prices in 2002 and 2005. Although complete tariff elimination was achieved only in 2006, the confounding effect of tariff reductions on "Normal" track commodities after July 2005 along with Philippines' inclusion in the EHP in 2006 makes it unsuitable as post-treatment comparison period. Nonetheless, this should not greatly affect our results, since most tariff targets had already been achieved by 2005.[9] The countries covered in this thesis are Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei was excluded because it did not report export data in 2005. Cambodia, Laos, Myanmar and Vietnam were also not included because these countries were subject to an extended timeline for tariff reductions under ACFTA (a concession that takes into account their status as the most underdeveloped economies in the region).

Was the EHP a success? In the first six months of 2004, exports from ASEAN to China grew by 39% (Hufbauer and Wong, 2005). Fruit exports from Thailand stood out in particular, growing by 80% over the same period. Yet, as previously discussed, trade values alone do not give us a complete picture about the effects of FTAs, nor do they explain heterogeneity in outcomes. Given the quasi-experimental set-up discussed in this section, ACFTA presents itself as a unique case study through which we can broaden our understanding of FTAs, by exploiting differences in treatment across products and countries to isolate and identify distinct price mechanisms.

[9] The Data section provides more detailed summary statistics showing the change in tariff rates between 2002 and 2005. By 2005, the average tariff rate on EHP exports in the dataset had fallen to 1.7%.

Section V: Theoretical Model

Overview

This section lays out the mechanisms underlying two distinct price effects, *incomplete tariff pass through* and *price competition*. Incomplete tariff pass through refers to the phenomenon where a reduction in tariff rates leads to an increase in the pre-tariff prices set by the firm, ceteris paribus. This is most easily observed when post-tariff prices do not move one-to-one with the magnitude of tariff reductions. Price competition refers to the phenomenon where tariff reductions on rival exporters force firms in other countries to lower prices in order to sustain their market share, even if their own tariff rates do not change.

The Theoretical Model

This framework is based on the model of export pricing developed by Chang and Winters (2002), with a few modifications to emphasize pre-tariff prices and allow for simultaneous price effects. Firms determine prices via Bertrand competition, resulting in a Nash equilibrium in which each firm selects prices such that neither can do better by unilaterally deviating and setting a different price. This model fails to account for product differentiation, dynamic competition and capacity constraints, but it is nonetheless useful for our analysis because it establishes a framework through which we can predict the direction of each price effect.

Demand (x_1) for a given export in China (Market 1) is a function of the export price (p_1) and competitor price (p_1^*), as well as the aggregate price level (I_1) and output (Y_1) of the importing country. p_1 reflects pre-tariff prices that are scaled by the tariff factor τ_1 (equal to one plus the tariff rate) in order to reflect the actual price paid by importers. p_1 is also scaled by the nominal exchange rate (e_1), since prices of an exported product are denominated in foreign currencies.

$$x_1 = x\left(\frac{\tau_1}{e_1}\, p_1\,,\, p_1^*\,, I_1\,, Y_1\right) \qquad (1)$$

Demand for the same product in the rest of the world (Market 2) is a function of the export prices (p_2), aggregate price levels (I_2) as well as world output (Y_2). The prices set by exporters from the rival country is assumed to have a negligible impact on world price. Therefore p^* does not appear in this function.

$$x_2 = x\left(\frac{\tau_1}{e_1} p_2\,, I_2\,, Y_2\right) \qquad (2)$$

Costs in both Markets 1 and 2 are determined by demand (x) as well as composite input costs (w). Assuming that input costs are homogenous of degree one, we can express the cost function as follows.

$$c_1 = c_1(x_1)w \qquad (3)$$

$$c_2 = c_2(x_2)w \qquad (4)$$

Combining (1) and (2), we arrive at the following revenue function.

$$Revenue = \; p_1\, x_1\left(\frac{e_1}{\tau_1}\, p_1\,,\, p_1^*\,, I_1\,, Y_1\right) + \; p_2\, x_1\left(\frac{e_2}{\tau_2}\, p_2\,, I_2\,, Y_2\right) \qquad (5)$$

The exporter's profit function can be derived by combining equations (3), (4) and (5).

$$\pi = \; p_1\, x_1\left(\frac{e_1}{\tau_1}\, p_1\,,\, p_1^*\,, I_1\,, Y_1\right) + \; p_2\, x_1\left(\frac{e_2}{\tau_2}\, p_2\,, I_2\,, Y_2\right) - \; c_1(x_1)w - \; c_2(x_2)w \qquad (6)$$

Exporters will set prices that satisfy the profit maximization function.

$$\max_{p_1, p_2}\left[\; p_1\, x_1\left(\frac{e_1}{\tau_1}\, p_1\,,\, p_1^*\,, I_1\,, Y_1\right) + \frac{e_2}{\tau_2}\, p_2\, x_1\left(\frac{e_2}{\tau_2}\, p_2\,, I_2\,, Y_2\right) - \; c_1(x_1)w - \; c_2(x_2)w\;\right]$$

If Markets 1 and 2 are segmented, then the firm will set prices independently in both markets. Solving the maximization function with respect to p_1 and p_2 will give us optimal prices as a function of input costs, exchange rates, tariff rates, rival prices, as well as the importer's aggregate

price level and output.

$$p_1 = f\left(\frac{w}{e_1}, \tau_1, p_1^*, I_1, Y_1\right) \quad (7)$$

$$p_2 = f\left(\frac{w}{e_2}, \tau_2, I_2, Y_2\right) \quad (8)$$

Since the profit maximization function is perfectly analogous for the rival firm,

$$p_1^* = f\left(\frac{w*}{e_1^*}, \tau_1^*, p_1, I_1, Y_1\right) \quad (9)$$

$$p_2^* = f\left(\frac{w*}{e_2^*}, \tau_2^*, , I_2, Y_2\right) \quad (10)$$

As such, the optimal price function for Market 1 can also be expressed as

$$p_1 = f\left(\frac{w}{e_1}, \tau_1, \frac{w*}{e_1^*}, \tau_1^*, I_1, Y_1\right) \quad (11)$$

By solving for prices using each firm's reaction functions and taking a log linear approximation we obtain the following estimation equations. Each coefficient is interpreted in terms of percent change between two time periods.

$$\ln p_1 = A + \eta_1 \ln \tau_1 + \beta_1 \frac{w}{e_1} + \delta_1^* \ln \frac{w^*}{e_1^*} + \lambda_1 \ln I + \mu_1 \ln Y \quad (12)$$

$$\ln p_2 = A + \eta_2 \ln \tau_2 + \beta_2 \frac{w}{e_2} + + \lambda_2 \ln I + \mu_2 \ln Y \quad (13)$$

The coefficient δ_1^* measures the effect of price competition. Although Winters and Chang designed this model to illustrate the impact of price competition on non-member countries, it can also apply to member countries in a multi-party FTA when rival firms in other member countries experience tariff reductions. δ_1^* represents the change in pre-tariff prices resulting from a change in tariff rates imposed on the rival exporter (τ^*). According to the price competition hypothesis, δ_1^* should be positive if the exporting country's demand becomes *more* elastic after a decrease in τ^*.

The coefficient η_1 measures the incomplete pass-through effect on member countries that experience a reduction in tariff rates. Non-member countries do not experience a change in τ_1, and therefore the term in τ_1 drops out such that there is no incomplete pass-through effect. According to the hypothesis, β_1 should be positive for member countries. The incomplete tariff pass through effect can be modeled by the following set of equations.

Consider a standard demand function in which quantity (x) and post-tariff prices (P) are inversely related:

$$x = b - aP \tag{14}$$

Substituting P as a function of pre-tariff prices (p) multiplied by the tariff factor τ gives us the following equation.

$$x = b - ap\tau \tag{15}$$

Revenues are calculated as a product of quantity and pre-tariff prices.

$$Revenue = Qp = (b - ap\tau)p = bp - ap^2\tau \tag{16}$$

Total costs are calculated as a product of quantity and input costs (w).

$$Cost = xw = (b - ap\tau)w = bw - ap\tau w \tag{17}$$

Since exports are produced in one country but sold in another, costs and prices are denominated in different currencies, and it is necessary to scale costs by the nominal exchange rate. Profit (Π) is equal to (16) subtracted by (17).

$$\Pi = bp - ap^2\tau - \frac{(bw - ap\tau w)}{e} = bp - ap^2\tau - (b - a\overline{p}\tau)\frac{w}{e} \tag{18}$$

Equivalently, profit can also be expressed as a product of quantity and mark-up over cost:

$$\Pi = (b - ap\tau)\left(p - \frac{w}{e}\right) \tag{19}$$

Profit is maximized by calculating the first-order condition with respect to P:

$$\mathrm{b} - 2\mathrm{a}\overline{p}\tau + \frac{\mathrm{aw}\tau}{e} = 0$$

$$\overline{p} = \frac{b}{2\tau a} + \frac{w}{2e} \tag{20}$$

Since τ and P are inversely correlated, an increase in tariff rates will induce firms to decrease pre-tariff prices. If elasticity of demand is less than one, a unit decrease in τ leads to a less than unit increase in P, which reflects incomplete tariff pass through.

It is possible for price competition to occur simultaneously with incomplete tariff pass through in member countries. An alternative way of interpreting price competition in this context is that the magnitude of incomplete tariff pass-through is constrained by the prices set by other member countries. Member firms can absorb some tariff savings by marking up pre-tariff prices, but they also face increased competition from exporters in other member countries that also benefit from reduced tariffs. Since rival firms in these countries can also sell their goods at lower post-tariff prices, the exporter cannot its their mark-up beyond a certain point without compromising its market share in the importing country.

The theoretical model does not provide conclusive predictions about the overall change in pre-tariff prices when both price mechanisms occur at the same time, because it is unable to gauge the relative magnitudes of the price competition and incomplete tariff pass through. The overall effect of an FTA expansion on pre-tariff prices in member countries is an empirical question, since both mechanisms work in opposite directions. Their cumulative effects collectively determine the overall change in prices, which can be positive or negative. Therefore, the empirical results of this thesis will not only allow for the identification of incomplete tariff pass through and price competition, but it will also point out which effect dominates in ACFTA.

Section VII: Data

The dataset was constructed by aggregating information reported by multiple sources. Trade statistics were collected from the United Nations Commodities Trade (UN ComTrade) database. GDP and exchange rates were obtained from the World Bank's World Development Indicators (WDI). Tariff information was assembled from the China Ministry of Commerce, World Trade Organization Integrated Data Base (WTO IDB) and United Nations Trade Analysis Information System (UN TRAINS).

The United Nations Commodities Trade (UN ComTrade) database is one the most comprehensive trade databases available, consisting of data since 1962 for more than 200 countries. [10] It reports the total values and quantities of a country's exports to each of its trade partners at different aggregated commodity levels. The Harmonized System (HS) code is a standardized nomenclature developed by the World Customs Organization (WCO), and it is used by 206 countries globally to record and categorize the flow of goods into and out of the country. Depending on the level of specificty required, products can be referenced at a two, four, six or eight digit level. Each major chapter in the Harmonized System is indicated by a 2-digit code, as listed in Table 1.

[10] More detailed information about the coverage and limitations of the data is available at http://comtrade.un.org/db/help/uReadMeFirst.aspx. Some important limitations are also discussed at greater length in this thesis

Figure 2: Harmonized System (HS) 2-Digit Classification

HS Chapter	Article Description
01-05	Animal & Animal Products
06-15	Vegetable Products
16-24	Foodstuffs
25-27	Mineral Products
28-38	Chemicals & Allied Industries
39-40	Plastics / Rubbers
41-43	Raw Hides, Skins, Leather, & Furs
44-49	Wood & Wood Products
50-63	Textiles
64-67	Footwear / Headgear
68-71	Stone / Glass
72-83	Metals
84-85	Machinery / Electrical
86-89	Transportation
90-97	Miscellaneous
98-99	Service

Source: US International Trade Commission[11]

Products categorized under HS Chapters 01-08 are covered under the Early Harvest Program (EHP). Products categorized under HS Chapters 09-99 are considered non-EHP products. Table 2 provides a more detailed description of the export categories included under the EHP.

[11] A full breakdown of each chapter at more detailed levels of classification is available from https://hts.usitc.gov/current.

Figure 3: Description and Number of Tariff Lines under HS 01-08

HS Chapter	Article Description
01	Live Animals
02	Meat and Edible Meat offal
03	Fish and Crustaceans, Mollusks and other Aquatic Invertebrates
04	Dairy produce; bird's eggs; natural honey, edible products of animal origin, not elsewhere specified or included
05	Products of animal origin, not elsewhere specified or included
06	Live trees and other plants, bulbs, roots and the like; cut flowers and ornamental foliage
07	Edible vegetables and certain roots and tubers; Potatoes, fresh or chilled
08	Edible fruits and nuts; peel of citrus fruits or melons

Source: Philippine Institute for Development Studies, 2007

The HS classification system has undergone multiple revisions to account for the changing nature of exports, such as the introduction of new products or the elimination of categories with negligible traded quantities. The 2002 edition entered into force in 1 January 2002, and a new version has been introduced every five years since. Due to a delay in adapting HS 2002 nomenclature, Indonesia and Philippines reported 2002 export data in terms of HS 1996 nomenclature. Unfortunately, not much can be done about this inconsistency, since conversion based on product concordance tables does not map one-to-one across different editions. Since there is a significant degree of overlap between both nomenclatures, only exports that are classified under the same six-digit commodity code in both versions are included in the dataset.[12]

This thesis uses export data at the HS 6-digit level. Prices are not directly reported on the UN ComTrade database, and they were calculated for each commodity, where price is equal to export value divided by quantity. This approach was adopted in multiple papers using the same database,

[12] Chang and Winters (2002) adopt a similar approach by deleting commodities that experience concordance problems across different HS nomenclatures.

including Chang and Winters (2002). Quantities are reported either as the number of discrete units, or in terms of net weight. Export values are converted and reported in USD, using a weighted average annual exchange rate that is calculated based on monthly exchange rates weighted by the monthly volume of trade. Export values are based on Free On Board (FOB) prices, which include the transaction value of the goods as well as the value of services performed to deliver them to the border of the exporting country. Prices quoted as FOB do not include duties, which are paid by the importer. As such, the data from UN ComTrade allows us to calculate pre-tariff prices.

Only commodities that were exported in both 2002 and 2005 are included in the dataset. In some cases, trade quantity was not reported, and observations with missing data were dropped from the dataset. Figure 4 shows the breakdown of commodities in the final dataset based on EHP/non-EHP classification.

Figure 4: Breakdown of EHP and Non-EHP Tariff Lines in Dataset

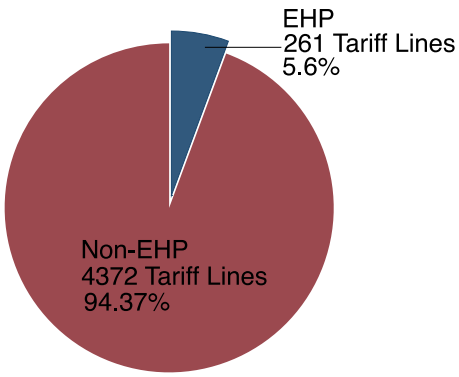
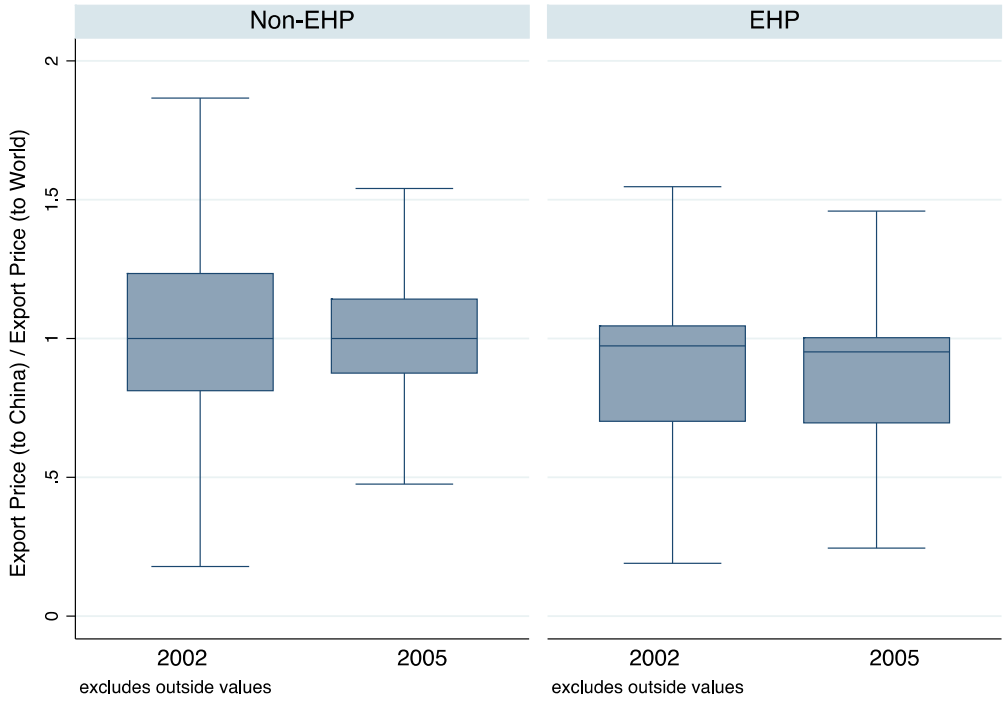


Figure 5 shows the distribution of normalized pre-tariff prices, which are plotted separately for EHP and non-EHP exports. The average pre-tariff price of each commodity exported to China was divided by the average pre-tariff price of the same commodity exported to ROW. This creates a relative index that allows for comparison across exports with very different prices. It also reflects the degree to which ASEAN's exports to China are underpriced or overpriced relative to its exports to ROW. The median relative export price is very close to one (0.9999872). From Figure 5 alone, it is not obvious if there was a change in relative price between 2002 and 2005 for either EHP or non-EHP products. It is therefore necessary to supplement the graph with more comprehensive analyses using regressions that control for other moving variables.

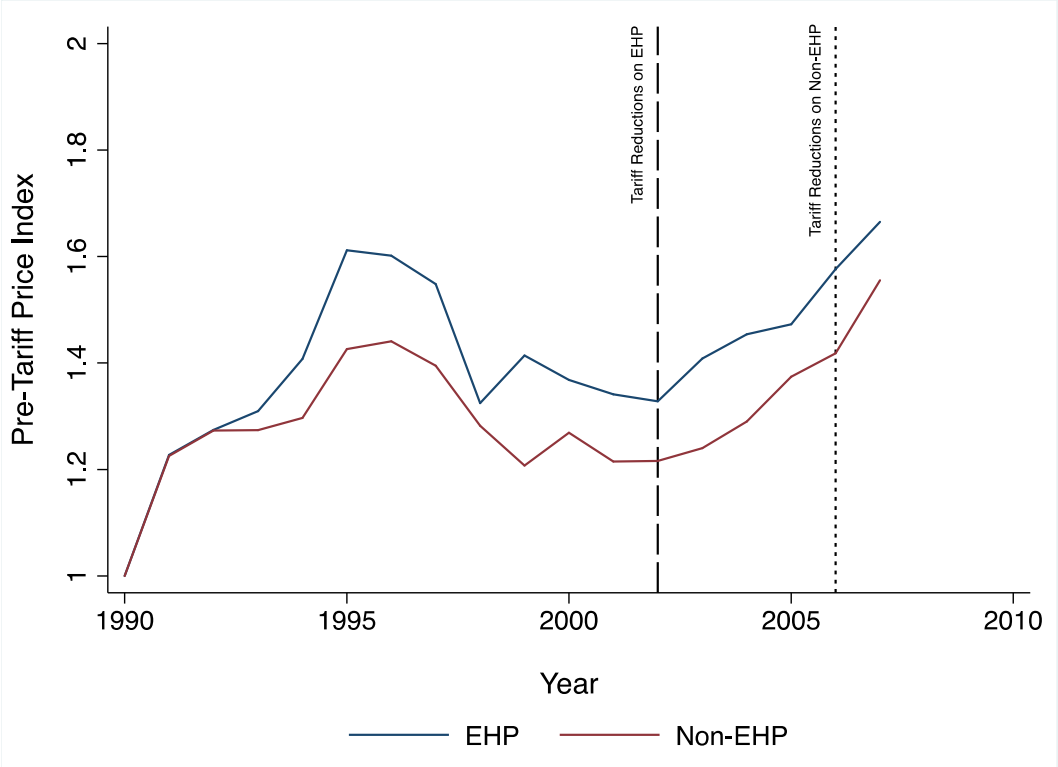
Figure 5: ASEAN-5 Normalized Pre-Tariff Export Prices to China, 2002 and 2005



This thesis uses non-EHP products as a control group in a differences-in-differences framework. However, this methodology relies on the assumption that similar time trends apply to both the treatment and control groups. Figure 4 tests this assumption by plotting an export price index between for each group between 1990 and 2007. This index tracks changes in the pre-tariff prices at which ASEAN sells its exports to the rest of the world. To allow for comparability in prices across product categories, the price of each export is divided by its base year price in 1990, which is normalized as 1. The price index is calculated by taking the simple average of normalized export prices in each year across all five ASEAN countries. The same "basket" of goods is used to construct this index, which only considers products that are reported under the same 6-digit HS code in every year between 1990 and 2007. This methodology ensures comparability across time, such that the index is not skewed by the introduction of new product categories. Figure 6 provides a visual representation of the similarity in price trends between EHP and non-EHP products prior to 2002. Prices of EHP exports grew slightly faster between 2002 and 2005 (compare the concavity and

convexity of the two plots). This gap closes quickly after 2005, when tariff reductions took place for non-EHP exports under the "Normal" track.

Figure 6: Pre-Tariff Export Price Index for ASEAN-5, 1990-2007 (Base Year = 1990)



Tariff rates on each commodity in a given year and for a given country were either determined by the WTO's MFN applied rates[13], preferential rates, or by the ACFTA EHP timeline. MFN applied tariffs in 2002 and 2005 were obtained from the United Nations Trade Analysis Information System (UN TRAINS), which converts and reports flat rate tariffs as ad valorem equivalents[14] (AVE) to ensure comparability. Preferential tariff rates in 2005 were obtained by combining data from UN TRAINS as well as from the China Ministry of Commerce.[15] If preferential

[13] Applied rates are equal to or less than the WTO bound duty rate, which sets a cap on the maximum tariff rate a country is allowed to impose on imported goods. Countries have the discretion to lower tariffs below the bound duty rate. The applied MFN rate is used because it more accurately reflects the actual effective tariff that is levied on imports.
[14] Levied custom duties are calculated as a percentage of the total value of transacted goods.
[15] Accessible through the China International Electronic Economic Center

rates for non-EHP exports were not reported by either source, tariffs were assumed to be equal to MFN applied rates.

Tariff data is reported at the level of 8-digit HS codes, which represents a more detailed classification that does not correspond one-to-one with export data from UN ComTrade that is reported at the 6-digit level. To overcome this mismatch, I truncated the last two digits of the 8-digit HS codes and took a simple average of the tariff rate on products that share the same truncated classification. This approach does not compromise the integrity of the dataset because there is very little variation in tariffs on products that share the same HS classification at the 6-digit level. Chang and Winters (2002) adopt the same approach in their empirical analysis.

Figure 7 shows the average tariff rates for member countries in 2002 and 2005, aggregated at the HS 2-digit commodity level. The dashed line indicates the boundary between commodities classified as EHP (HS 01-08) and non-EHP (HS 09-99). Tariffs fell by a much greater magnitude for EHP products, as observed from the larger gap between the two graphs.

Figure 7: Average Tariff Rate by 2-Digit HS Code, 2002 and 2005 (Member Countries)

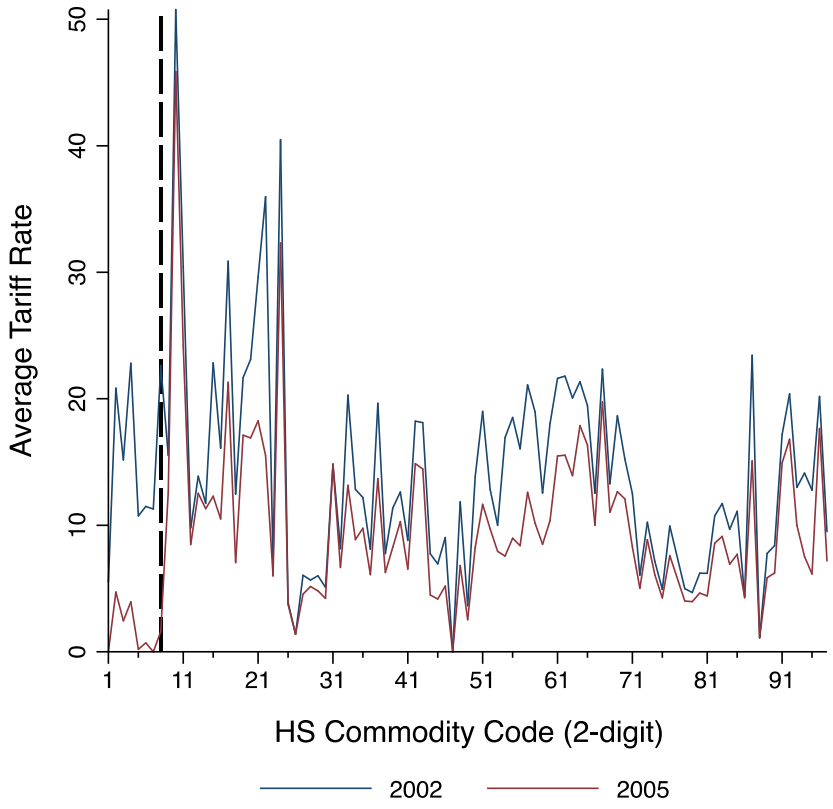


Figure 8 further breaks down the difference in tariff treatments, showing the average change in tariff rates for EHP and non-EHP exports between 2002 and 2005. EHP exports were subject to higher tariff rates of 16.3% prior to ACFTA, compared to 12.9% for non-EHP exports. However, tariffs for EHP exports also fell by a much higher average of 14.5% between 2002 and 2005, compared to 3.7% for non-EHP exports, resulting in a reversal of pre-ACFTA trends.

Figure 8: Change in Average Tariff Rate between 2002 and 2005 (Member Countries)

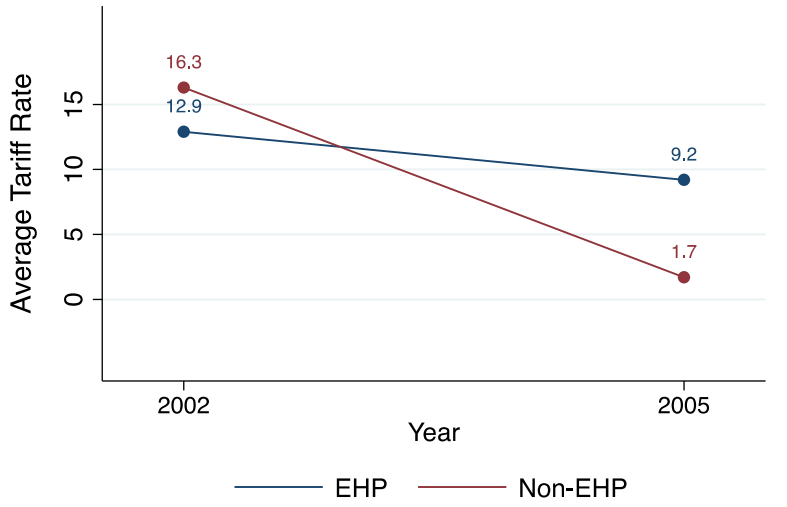
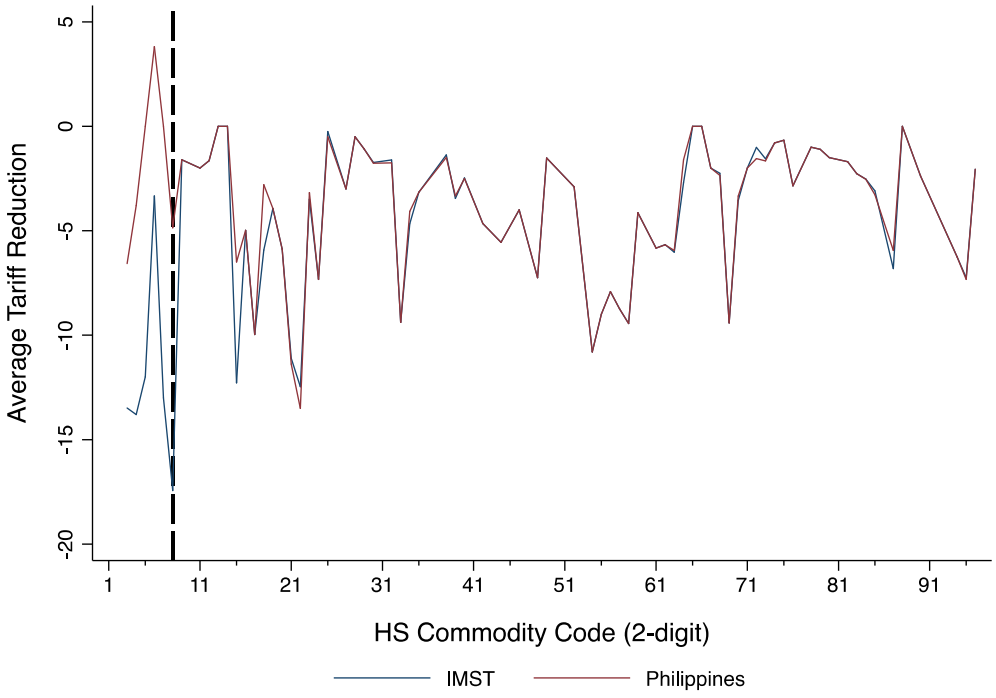


Figure 9 shows the average change in tariff rates between 2002 and 2005 for member countries (Indonesia, Malaysia, Singapore and Thailand) and non-member countries (Philippines). The dashed line indicates the boundary between commodities classified as EHP (HS 01-08) and non-EHP (HS 09-99). Tariff rates on non-EHP exports are similar across members and non-members, but tariff rates on EHP products are much lower in member countries.

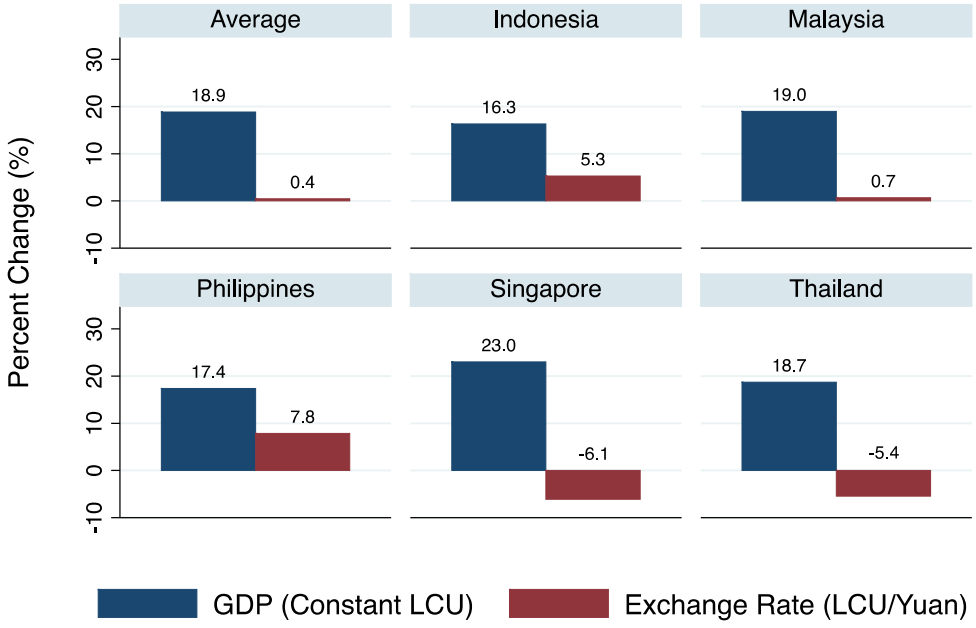
Figure 9: Average Tariff Reduction between 2002 and 2005 by 2-digit HS Code



Real GDP in constant local currency units (LCU) and nominal exchange rates in LCU/Yuan[16] were obtained from the World Trade Organization World Development Indicators (WDI). Figure 10 summarizes the change in both variables between 2002 and 2005.

[16] Exchange rates in LCU/Yuan are not directly reported by the WDI, so it was indirectly calculated using USD as the reference currency. LCU/USD was divided by Yuan/USD to obtain LCU/Yuan.

Figure 10: Change in Exchange Rate and Real GDP by Country, 2002-2005



Section VI: Methodology

Overview

In order to estimate the magnitude and direction of incomplete tariff pass-through and price competition, two-period differences-in-differences regression specifications will be used to compare the outcomes of treatment and control groups. Since the "treatment" effect is not randomly assigned, triple differences-in-differences regressions will also be used to account for identification problems. By showing that the effects of incomplete tariff pass-through and price-competition are consistent and robust regardless of the control groups used in the regression, we can be confident that both price mechanisms function as predicted.

This section first defines the treatment and control groups that are used in the analysis. Next, it describes the dependent and independent variables used in the empirical study. Finally, it outlines the regression specifications that are used in the empirical analysis, and explains the predicted signs of each coefficient based on the hypotheses. Although this section provides intuitive explanations for each regression specification as well as brief justifications for the choice of variables, Appendix A presents a more rigorous justification for the empirical design of this thesis, and explains each regression in terms of the theoretical model.

Identifying Treatment and Control Groups

ACFTA is an ideal case study because it provides a quasi-experimental set-up with multiple treatment and control groups.

(1) EHP (Treatment) vs. Non-EHP (Control)

First, tariff reductions only applied to EHP commodities during the period between 2002 to 2005. Tariff rates on non-EHP commodities were unaffected by ACFTA prior to July 2005, and therefore non-EHP commodities did not experience either incomplete tariff pass through or price competition effects before 2005.

(2) Member (Treatment) vs. Non-member (Control)

Second, the Philippines only joined the Early Harvest Program in 2005 (with tariff eliminations taking effect in 2006). As a non-member, it did not enjoy tariff reductions between 2002 and 2005. Non-member EHP exports are therefore not affected by incomplete tariff pass through under ACFTA.

(3) Non-Monopoly (Treatment) vs. Monopoly (Control)

Third, each country exports certain commodities to China that the rest of ASEAN-5 do not export, which gives it a monopoly producer status for these commodities. Since the exporting country is the only supplier of the product, there is no price pressure exerted by other member countries.

(4) Initial Non-Zero Tariff (Treatment) vs. Initial Zero Tariff (Control)

Fourth, some categories of exports were already at zero tariffs *prior* to ACFTA, which means they were not able to undergo further tariff reductions. As such, initial zero tariff exports are *not* affected by either incomplete tariff pass through or price competition.

Figure 11 consolidates the different categorizations and presents the relevant information in table form. It also states how ACFTA affects each category based on the theoretical model. As previously explained, simply comparing two groups across columns may be problematic, because the "treatment" effect is not randomly assigned. The identification of multiple control groups allows us to account for asymmetry in time trends.

Figure 11: Price Effects on Each Country and Product Category

	EHP			Non-EHP
	Non-Monopoly	Monopoly		
	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

Defining Variables

Price Variables

$ExportPrice$ is the dependent variable that specifies pre-tariff prices of exports to China at each commodity level. $ExportPriceWorld$ is an independent variable that specifies pre-tariff prices of exports to ROW at each commodity level. Logarithms are applied to the raw price data in order to reduce the variability in prices across different product categories. It also allows for interpretation of regression coefficients in terms of percent changes rather than absolute changes.

$ExportPriceWorld$ is included as a control variable because it captures changes in unobserved product characteristics such as export quality. It also functions as a better proxy for price inflation at the commodity level, compared to more general indicators such as the consumer price index or GDP deflator. As such, controlling for $ExportPriceWorld$ allows us to isolate the impact of ACFTA without the confounding effects of other omitted variables that may affect export prices regardless of changes in tariff rates.

Quantity Variables

Although quantity changes are not formally specified in the theoretical model, they are included as independent variables given their inverse relationship with prices. $Quantity$ represents the total quantity of exports to China at each commodity level. $WorldQuantity$ represents the total quantity of exports to ROW at each commodity level. Logarithms are again applied to the raw data to reduce variability as well as to allow for interpretation of regression coefficients in terms of percent changes.

Other Country-Level Control Variables

$Controls$ refer to GDP and nominal exchange rate, which vary between periods and across countries. Unlike the price and quantity variables described above, these control variables do not vary at the product level. They reflect non-tariff determinants of export prices, as outlined in the theoretical model.

Gross domestic product is used as a proxy for composite input costs, since this data is not available at the industry or commodity level.[17] Real GDP reported in constant base year prices is used in place of nominal GDP. This is because exports are calculated as part of GDP, and a change in exports prices will lead to a proportional change in nominal GDP. Using real GDP eliminates the risk of reverse causality.

Nominal exchange rates account for the effects of incomplete exchange rate pass through, which occurs when costs and prices are reflected in different currencies. In this case, costs are incurred in the local currency units of the exporting country, while prices in denominated in Chinese Yuan. Therefore, it is necessary to control for changes in the LCU/Yuan exchange rate when aggregating data across countries. This is less relevant when comparing prices of commodities exported by the same country, since changes in exchange rates affects all exports. Incomplete

[17] Chang and Winters (2002) use the GDP deflator as a proxy for input costs, but this could also lead to reverse causality in the regression estimation, as exports factor into the calculation of GDP, and a change in export prices would directly affect nominal GDP and consequently the GDP deflator.

exchange rate pass through is a separate price mechanism from incomplete *tariff* pass-through, and it is not caused by FTAs.

Regression Specifications

The empirical analysis in this paper can be divided into three sections. In all subsequent regressions, the subscripts *c*, *p* and *t* refer to country, commodity and period respectively. Textile products under HS Chapters 50-63 are excluded in a number of regression specifications due to potential confounding effects of the Multi Fiber Arrangement.[18]

Part One: How ACFTA Affected ASEAN

First, this thesis investigates how how ACFTA affected the pre-tariff export prices in each country. How did these outcomes vary across countries, and in particular, how did outcomes for the Philippines compare to the rest of ASEAN? In order to make fair comparisons between different countries, the dataset used in this section only includes products that are exported to China by all members of ASEAN-5 in both 2002 and 2005. (As such, this dataset also excludes monopoly exports.) Although this approach significantly decreases the number of observations, the trade-off between breadth and accuracy is necessary in order to fairly assess outcomes. Textile exports are excluded from the dataset in this section, so as to eliminate potential confounding effects of the Multi Fiber Agreement. Only commodities with initial tariff rates greater than zero were included in the regression. Standard errors were clustered at the level of two-digit HS commodity codes.

Regression (1) -- Double Differences: EHP vs. Non-EHP

[18] The Multi Fiber Agreement imposed quotas on textile exports between 1974 and 2004 (Brambilla et al., 2007). The expiry of this agreement in January 2005 could have precipitated a significant change in export prices of textiles, thereby creating an identification problem when attempting to isolate the effects of ACFTA.

Figure 12: EHP vs. Non-EHP By Country

	EHP			Non-EHP
	Non-Monopoly	Monopoly		
	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

(Treatment Groups in Green, Control Groups in Red)

$$ExportPrice_{\text{pt}} = \eta + \mu WorldExportPrice_{pt} + \sigma Quantity_{pt} + \omega WorldQuantity_{pt} + \gamma Post + \delta EHP + ג(EHP * Post) + \varepsilon_{pt}$$

Regression (1) estimates the overall effect of ACFTA by comparing the change in prices of EHP exports relative to non-EHP exports for each country. Based on the hypothesis, the coefficient ג should be negative for the Philippines due to the price competition effect on non-members. ג could be either positive or negative for members countries, depending on which price mechanism dominates.

Part Two: Breaking Down Price Effects

This section tests the hypothesis that the overall price effects of ACFTA can be attributed to price competition and incomplete tariff pass through. It does not emphasize differences in outcomes between member and non-member countries, but instead focuses on decomposing the price effects of ACFTA on member countries into distinct mechanisms.

The data in this section was aggregated across member countries. Country controls and country fixed effects are included in the regression specifications in order to account for variation

across countries. Standard errors were clustered by commodity, allowing prices to be serially correlated. Since this section does not require cross-country comparisons, the dataset is not limited to commodities that are exported by all countries, which allows us to work with a much larger number of observations than in Part One.

Regressions (2) and (3) estimate the effects of incomplete tariff pass through, while regressions (3) and (4) estimate the effects of price competition. Each regression also consists of sub-variations along the following dimensions. They function as robustness tests to ensure that the same price effect is consistently observed.

- Restricted samples based on pre-ACFTA tariff rates
    - Restrictions: Non-Zero, Greater than 5%, Greater than 10%
    - Initial tariff rates correlate directly with the intensity of the treatment effect, since tariff reductions are greater for commodities that start off at a higher tariff rate

- Includes/Excludes Textiles
    - Applicable when non-EHP exports are used a primary comparison group

- Controls and County Fixed Effects
    - Baseline: Does not include country controls or country fixed effects
    - Full: Includes both country controls and country fixed effects

Regression (2) – Incomplete Tariff Pass Through

Double Differences: Monopoly EHP vs. non-EHP

Figure 13: Monopoly EHP vs. Non-EHP

	EHP	Non-EHP

	Non-Monopoly	Monopoly		
	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

(Treatment Group in Green, Control Group in Red)

$$ExportPrice_{\text{cpt}} = \eta + \mu WorldExportPrice_{cpt} + \sigma Quantity_{cpt} + \omega WorldQuantity_{cpt} + \gamma Post + \delta MonopolyEHP + \lambda(MonopolyEHP * Post) + \beta_i Controls_{\text{i,ct}} + \alpha_c + \varepsilon_{cpt}$$

Regression (2) compares the change in prices of monopoly EHP exports and non-EHP exports. The coefficient ג represents the magnitude and direction of the incomplete tariff pass-through effect, since price competition does not apply to monopoly exports. Based on the hypothesis, the reduction of tariffs on monopoly EHP exports should lead an increase in pre-tariff prices relative to non-EHP exports that do not experience tariff reductions. Therefore, the coefficient on ג should be positive.

Regression (3) – Incomplete Tariff Pass Through

Triple Differences: Non-Zero Tariff Monopoly EHP vs. Zero Tariff Monopoly EHP

(further controlling for Non-Zero Tariff non-EHP vs. Zero Tariff non-EHP)

Figure 14: Non-Zero Tariff Monopoly EHP vs. Zero Tariff Monopoly EHP

	EHP	Non-EHP

	Non-Monopoly	Monopoly		
	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

(Treatment Group in Green, Control Groups in Red)

$$ExportPrice_{cpt} = \eta + \mu WorldExportPrice_{cpt} + \sigma Quantity_{cpt} + \omega WorldQuantity_{cpt} + \gamma Post + \delta NonZeroTariff + \lambda(NonZeroTariff * Post) + \varphi \text{EHP} + \psi(EHP * Post) + \rho(NonZeroTariff * EHP) + \phi(NonZeroTariff * EHP * Post) + \beta_i Controls_{\text{i,ct}} + \alpha_c + \varepsilon_{cpt}$$

Regression (3) presents another way of isolating and estimating the magnitude of incomplete tariff pass-through. It compares the change in prices between monopoly EHP exports where pre-ACFTA tariff rates were already at zero, and monopoly EHP exports for which pre-ACFTA tariff rates were above zero. Because ACFTA has no effect on exports that were already at zero tariffs, the difference in treatment effect between the two groups represents only the incomplete tariff pass-through effect. The identification problem associated with EHP exports that were already at zero tariffs is addressed by using a triple differences-in-differences framework. This approach accounts for asymmetric time trends by further comparing between initial zero tariff and initial non-zero tariff non-EHP commodities, which function as a secondary control group. The coefficient ϕ represents the magnitude and direction of the incomplete tariff pass-through effect. According to the hypothesis, monopoly exports that are affected by tariff reductions should experience a greater increase in prices. As such, the coefficient on ϕ should be positive.

Regression (4) — Price Competition

Double Differences: Non-Monopoly EHP vs. Monopoly EHP

Figure 15: Non-Monopoly EHP vs. Monopoly EHP

	EHP			Non-EHP
	Non-Monopoly	Monopoly		
	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

(Treatment Group in Green, Control Group in Red)

$$ExportPrice_{\mathrm{cpt}} = \eta + \mu WorldExportPrice_{cpt} + \sigma Quantity_{cpt} + \omega ChinaQuantity_{cpt} + \gamma Post + \delta NonMonopoly + \lambda(NonMonopoly * Post) + \beta_i Controls_{\mathrm{i,ct}} + \alpha_c + \varepsilon_{cpt}$$

Regression (4) compares the change in prices of non-monopoly EHP exports relative to monopoly EHP exports. Both groups experience incomplete tariff pass through as a result of tariff reductions, but only non-monopoly products are subject to increased price competition with other ASEAN exporters. The coefficient λ represents the difference between both groups, and it therefore reflects the price competition effect. Exporters of non-monopoly EHP products face the constraints of price competition, and so their pre-tariff prices are likely to increase by a smaller magnitude compared to monopoly products. According to the hypothesis, λ should therefore be negative.

Regression (5) – Price Competition

Triple Differences: Non-Monopoly EHP vs. Monopoly EHP

(further controlling for Non-Monopoly non-EHP vs. Monopoly non-EHP)

Figure 16: Non-Monopoly EHP vs. Monopoly EHP

	EHP		Non-EHP
	Non-Monopoly	Monopoly	

	Initial Tariff > 0	Initial Tariff > 0	Initial Tariff = 0	
Member	Incomplete Tariff Pass Through (+) & Price Competition (-)	Incomplete Tariff Pass-Through (+)	No Effect	No Effect
Non-Member	Price Competition (-)	No Effect		No Effect

(Treatment Group in Green, Control Groups in Red)

$$ExportPrice_{\text{cpt}} = \eta + \mu WorldExportPrice_{cpt} + \sigma Quantity_{cpt} + \omega WorldQuantity_{cpt} + \gamma \text{Post} + \delta NonMonopoly + \lambda(NonMonopoly * Post) + \varphi \text{EHP} + \psi(EHP * Post) + \rho(NonMonopoly * EHP) + \phi(NonMonopoly * EHP * Post) + \beta_i Controls_{\text{i,ct}} + \alpha_c + \varepsilon_{cpt}$$

Regression (5) supplements (4) by addressing the identification problem associated with monopoly exports. It is a triple differences regression that accounts for asymmetric time trends between non-monopoly and monopoly tariff EHP exports by further comparing between non-monopoly and monopoly non-EHP products, which function as a secondary control group. The negative of coefficient ϕ represents the direction and magnitude of the price competition effect. According to the hypothesis, ϕ should be negative.

Section VIII: Results and Discussion

This section presents the empirical results of regressions (1) through (5) in the corresponding tables (1) through (5), and discusses these findings in relation to the hypothesis. It first compares the effects of ACFTA on member and non-members countries, observing for differences it outcomes. It subsequently discusses the incomplete tariff pass through and price competition effects, and investigates whether these mechanisms did occur as a result of ACFTA.

It should also be noted that the coefficients in the regression results table are interpreted as percentage change over the three-year period between 2002 and 2005. As such, they may appear to be fairly large, relative to average expectations of price growth or inflation.

Part One: How Did ACFTA Affect ASEAN?

Table 1

Double Differences: EHP vs. non-EHP

	(1a) Indonesia	(1b) Malaysia	(1c) Singapore	(1d) Thailand	(1e) Philippines
Post	-0.0718	-0.128	-0.194**	-0.00840	-0.0511
	(0.129)	(0.0914)	(0.0782)	(0.0829)	(0.117)
EHP	-0.481**	0.0119	-0.779***	-0.489**	-0.572***
	(0.173)	(0.176)	(0.196)	(0.189)	(0.109)
*EHP*Post*	0.153	0.452*	0.373***	0.369**	-0.145
	(0.146)	(0.250)	(0.0938)	(0.164)	(0.130)
Observations	224	224	224	224	224
R-squared	0.854	0.904	0.863	0.866	0.868

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the overall impact of ACFTA on the treatment EHP group (indicated by coefficient on interaction variable *EHP*Post*) across member countries Indonesia, Malaysia, Singapore and Thailand (4a-4d), as well as the non-member country, Philippines (1e).

Regressions (1a) – (1e) sets the stage by first examining the overall pre-tariff prices effects of ACFTA. It tests if there is a change in pre-tariff prices of EHP products relative to non-EHP products, using a differences-in-differences approach to control for overall trends in export prices that are unrelated to ACFTA. In the case of member countries Indonesia, Malaysia, Singapore and Thailand, the positive coefficient on the interaction variable $EHP*Post$ shows that pre-tariff prices of EHP exports had increased relative to non-EHP exports. This result is statistically significant for Malaysia, Singapore and Thailand. The magnitudes of the coefficients indicate that pre-tariff prices increased by 15.3% to 45.2% across member countries. Although the theoretical model does not provide conclusive predictions about the relative magnitudes of incomplete tariff pass through and price competition, these empirical results suggest that in the case of ACFTA, the incomplete tariff pass-through effect is stronger than the price competition effect, leading to an overall increase in terms-of-trade for member countries.

The Philippines is the only non-member, and it is also the only country where the coefficient on $EHP*Post$ is negative. This implies that the prices for EHP exports have actually declined relative to non-EHP exports. The magnitude of the coefficient in (1e) indicates that ACFTA resulted in a 14.5% decline in pre-tariff prices. This result is consistent with the model, where non-member countries are forced to lower prices due to increased competition with cheaper exports from member countries, but they do not experience the mitigating positive price effects of incomplete tariff pass through.

(Appendix B includes a more formal comparison of each member country against the Philippines, showing that the differences in pre-tariff prices are statistically significant for all country pairs.)

Thus far, we can conclude that ACFTA has indeed resulted in different outcomes between member and non-member countries. Given that this regression compares prices of identical commodities, the terms-of-trade loss experienced by the Philippines differentiates it from the rest of ASEAN-5.

Part Two: Breaking Down Price Effects

Table 2 – Incomplete Tariff Pass Through

Double Differences: Monopoly EHP vs. non-EHP

	(2a)	(2b)	(2c)	(2d)	(2e)	(2f)
			Tariff > 10%			
	Tariff > 0%	Tariff > 5%		Non-Textile		
				Baseline	Country FE	Full
Post	0.0450***	0.0464***	0.0610***	0.0403***	0.0347**	0.0631***
	(0.00842)	(0.00899)	(0.0116)	(0.0140)	(0.0138)	(0.0142)
MonopolyEHP	-0.241*	-0.278**	-0.232*	-0.291**	-0.403***	-0.401***
	(0.124)	(0.119)	(0.121)	(0.126)	(0.122)	(0.123)
*MonopolyEHP*Post*	0.0830	0.114	0.109	0.130	0.147	0.144
	(0.0956)	(0.0969)	(0.104)	(0.0987)	(0.0991)	(0.100)
Observations	24,050	21,436	12,702	8,926	8,926	8,926
R-squared	0.951	0.951	0.945	0.954	0.955	0.955
Pre-ACFTA Tariff	Non-Zero	>5%	>10%	>10%	>10%	>10%
Textiles	Yes	Yes	Yes	No	No	No

Controls	No	No	No	No	No	Yes
Country Fixed Effects	No	No	No	No	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the effect of incomplete tariff pass through (indicated by coefficient on interaction variable *MonopolyEHP*Post*) across different restricted samples based on initial tariff rates (2a-2c). It further tests for robustness and sensitivity to controls and country fixed effects (2d-2f).

Table 3 – Incomplete Tariff Pass Through

Triple Differences: Initial Non-Zero Tariff Monopoly EHP vs. Initial Zero Tariff Monopoly EHP
(further controlling for Initial Non-Zero Tariff non-EHP vs. Initial Zero Tariff non-EHP)

	(3a)	(3b)	(3c)	(3d)	(3e)	(3f)
		Tariff > 5%				
	Tariff > 0%		Non-Textiles			
			Baseline	Country FE	Controls	Full
After	0.276***	0.282***	0.205***	0.103**	0.226***	0.131***
	(0.0450)	(0.0460)	(0.0454)	(0.0477)	(0.0696)	(0.0477)
NonZeroTariff	0.205***	0.206***	0.172***	0.0533	0.190***	0.0534
	(0.0287)	(0.0301)	(0.0309)	(0.0490)	(0.0527)	(0.0490)
*NonZeroTariff*Post*	-0.242***	-0.247***	-0.185***	-0.0779	-0.204***	-0.0782
	(0.0451)	(0.0462)	(0.0458)	(0.0486)	(0.0642)	(0.0486)
EHP	0.433***	0.433***	0.411***	0.401***	0.509***	0.391***

	(0.0289)	(0.0306)	(0.0310)	(0.0531)	(0.0732)	(0.0547)
*EHP*Post*	-0.257***	-0.264***	-0.184***	-0.0797*	-0.194***	-0.0582
	(0.0449)	(0.0458)	(0.0453)	(0.0476)	(0.0576)	(0.0524)
*NonZeroTariff*EHP*	-0.727***	-0.766***	-0.797***	-0.825***	-0.883***	-0.811***
	(0.128)	(0.124)	(0.130)	(0.132)	(0.128)	(0.133)
*NonZeroTariff*EHP*Post*	0.357***	0.395***	0.333***	0.227**	0.344***	0.200*
	(0.107)	(0.109)	(0.106)	(0.106)	(0.114)	(0.109)
Observations	24,662	22,048	18,050	18,050	18,050	18,050
R-squared	0.952	0.951	0.957	0.957	0.957	0.957
Pre-ACFTA Tariff	>0	>5%	>5%	>5%	>5%	>5%
Textiles	Yes	Yes	No	No	No	No
Controls	No	No	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes	No	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the effect of incomplete tariff pass through (indicated by coefficient on interaction variable *NonZeroTariff*EHP*Post*) across different restricted samples, based on initial tariff rates of the treatment group (3a-3b). It further tests for robustness and sensitivity to controls and country fixed effects (3c-3e).

Regressions (2a – 2f) show that prices of monopoly EHP products increased relative to non-EHP products. The difference between these two groups represents the incomplete tariff pass-through effect. The coefficient on the interaction term $MonopolyEHP*Post$ is positive regardless of initial tariff levels, and the magnitude of the coefficient in (2a) indicates that the incomplete tariff pass through effect increased pre-tariff price growth by 8.3 percentage points. However, these coefficients are not statistically significant even after accounting for controls, country fixed effects and restricting the regression to commodities with initial tariff rates above 10% (p-value=0.151 in 2(f)). This could be attributed to identification problems associated with EHP vs. non-EHP exports. As such, it is necessary to utilize another regression framework to address this limitation.

Regressions (3a – 3f) employ a different approach to estimating the incomplete tariff pass through effect. It compares changes in pre-tariff prices between monopoly EHP products that were already at zero tariffs *prior* to ACFTA, and monopoly EHP products with tariffs above zero prior to ACFTA. This solves the identification problem in (2), because we are now comparing within the category of EHP exports. Furthermore, the identification problem associated with exports that were already at zero tariffs in 2002 is addressed by using the corresponding non-EHP categories as a secondary control group. The difference between the treatment and control groups in (3) represents the incomplete tariff pass through effect.

Table 3 shows that the coefficient on the triple interaction term $NonZeroTariff*EHP*Post$ is positive and statistically regardless of initial tariff rates, even after including controls and country fixed effects. The magnitude of the coefficient in (3a) indicates that the incomplete tariff pass through effect increased pre-tariff price growth by 35.7 percentage points. This result is in line with the incomplete tariff pass through hypothesis, because it demonstrates that firms have raised pre-tariff prices in response to tariff reductions.

Table 4 – Price Competition

Double Differences: Non-Monopoly EHP vs. Monopoly EHP

	(4a)	(4b)	(4c)	(4d)	(4e)
	Tariff > 0%	Tariff > 5%			
		Baseline	Controls	Control FE	Full
Post	0.122	0.161	0.111	0.162	0.136
	(0.116)	(0.118)	(0.109)	(0.109)	(0.102)
NonMonopoly	0.0756	0.121	0.0792	0.172	0.159
	(0.129)	(0.122)	(0.120)	(0.117)	(0.118)
*NonMonopoly*Post*	-0.177	-0.219*	-0.205*	-0.218*	-0.195*
	(0.119)	(0.121)	(0.116)	(0.113)	(0.111)
Observations	1,284	1,200	1,200	1,200	1,200
R-squared	0.774	0.768	0.774	0.791	0.791
Pre-ACFTA Tariff	Non-Zero	>5%	>5%	>5%	>5%
Controls	No	No	Yes	No	Yes
Country Fixed Effects	No	No	No	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the effect of price competition (indicated by coefficient on interaction variable *NonMonopoly*Post*) across different restricted samples based on initial tariff rates (4a-4b). It further tests for robustness and sensitivity to controls and country fixed effects (4c-4e).

Table 5

Triple Differences: Non-Monopoly EHP vs. Monopoly EHP

(further controlling for Non-Monopoly non-EHP vs. Monopoly non-EHP)

	(5a)	(5b)	(5c)	(5d)	(5e)	(5f)
	Tariff > 0%	Tariff > 5%	Tariff > 10%			
			Baseline	Controls	Country FE	Full
Post	0.0853	0.0785	0.0594	0.0615	0.0634	0.0824
	(0.0542)	(0.0582)	(0.0769)	(0.0772)	(0.0759)	(0.0765)
NonMonopoly	0.0582	0.0264	-0.0919	-0.0964	-0.0674	-0.0708
	(0.0488)	(0.0541)	(0.0646)	(0.0645)	(0.0643)	(0.0643)
*NonMonopoly*Post*	-0.0500	-0.0419	-0.00876	-0.00926	-0.0112	-0.00446

	(0.0547)	(0.0588)	(0.0776)	(0.0774)	(0.0766)	(0.0766)
EHP	-0.258**	-0.332***	-0.410***	-0.400***	-0.405***	-0.404***
	(0.131)	(0.128)	(0.134)	(0.131)	(0.130)	(0.130)
*EHP*Post*	0.0511	0.0912	0.124	0.124	0.119	0.118
	(0.112)	(0.115)	(0.132)	(0.131)	(0.129)	(0.129)
*NonMonopoly*EHP*	0.0819	0.154	0.275**	0.267**	0.276**	0.276**
	(0.134)	(0.132)	(0.138)	(0.136)	(0.134)	(0.135)
*NonMonopoly*EHP*Post*	-0.134	-0.179	-0.233*	-0.232*	-0.229*	-0.228*
	(0.116)	(0.119)	(0.136)	(0.135)	(0.133)	(0.134)
Observations	25,228	22,534	13,722	13,722	13,722	13,722
R-squared	0.925	0.922	0.908	0.909	0.943	0.943
Pre-ACFTA Tariff	Non-Zero	>5%	>10%	>10%	>10%	>10%
Controls	No	No	No	Yes	No	Yes
Country Fixed Effects	No	No	No	No	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the effect of price competition (indicated by coefficient on interaction variable *NonMonopoly*EHP*Post*) across different restricted samples based on initial tariff rates (5a-5c). It further tests for robustness and sensitivity to controls and country fixed effects (5d-5f).

Regressions (4a-4f) compare outcomes between monopoly and non-monopoly EHP products across all countries. The results show support for the price competition hypothesis, where coefficients on the interaction variable $NonMonopoly*Post$ are negative regardless of initial non-zero tariff levels. It is statistically significant for exports with an initial tariff rate of more than 5%, even after accounting for controls and country fixed effects. The magnitude of the coefficient in (4a) indicates that the price competition effect reduced pre-tariff price growth by 17.7 percentage points.

Regressions (5a–5f) also compare outcomes between monopoly and non-monopoly EHP products, but further account for identification problems associated with monopoly exports by using a triple differences-in-differences approach. The results from Table 5 further reinforce support for the price competition hypothesis, since the coefficient on the triple interaction variable $NonMonopoly*EHP*Post$ is negative regardless of initial non-zero tariff levels. It is statistically significant for exports with an initial tariff rate of more than 10%, even after accounting for controls and country fixed effects. The magnitude of the coefficient in (5a) indicates that the price competition effect reduced pre-tariff price growth by 13.4 percentage points. This represents a more conservative estimate of the price competition effect compared to (4a).

Both regressions results are in line with the hypothesis of this thesis, where an increase in price competition should result in downward pressure on pre-tariff export prices.

To summarize, the direction of price effects indicated by the coefficients on the various interaction terms are largely in line with the predictions set forth earlier in this paper. It is consistently noted throughout regressions (2) – (4) that commodities with higher initial tariff rates also saw the most significant price competition and incomplete pass through effects. This is likely because tariff reductions are higher for these commodities, and since the treatment effect is stronger, the price effects increase in magnitude as well.

Section X: Conclusion

This thesis provides evidence in support of incomplete tariff pass-through and price competition, using data from the ASEAN-China Free Trade Area. The empirical results showing that

their effects on pre-tariff prices are considerable. Incomplete tariff pass-through causes exporters in member countries to raise pre-tariff prices in response to tariff reductions. At the same time, price competition exerts downward pressure on pre-tariff prices, forcing exporters in both member and non-member countries to lower pre-tariff prices in order to remain competitive. These findings support existing literature on FTAs in other parts of the world, showing that the same price effects apply even in a different geographical context that is characterized by different levels of economic development, industrial organization and trade patterns.

An important contribution of this thesis is the discovery that both price mechanisms can happen simultaneously. While previous literature has examined incomplete tariff pass through in the context of members and price competition in the context of non-members, this case study shows that even member countries can be affected by increased price competition in a multi-party FTA, as evidenced by the difference in price changes between monopoly and non-monopoly EHP products. What this implies is that as the number of countries in an FTA increases, the effects of price competition are likely to increase as well, since the likelihood of being a monopoly producer of a given product decreases. This finding relates to questions about the disruptive nature of multilateral FTAs, in which price effects are less straightforward compared to bilateral FTAs. The implied payoff structure of price competition introduces a new dimension of complexity, by creating incentives to undercut other countries. This analysis generates the following theoretical predictions.

First, a member of an existing FTA should experience a greater increase in pre-tariff export prices through bilateral FTAs with non-members, rather than a multilateral FTA through non-member accession. From the point of view of each ASEAN member state, signing a bilateral FTA with China without the involvement of other members would have resulted in the positive effects of incomplete tariff pass through, without the negative effects of price competition from other ASEAN exporters. In the case of ACFTA, member countries still saw an overall increase in pre-tariff prices despite the downward pressure of price competition, but this could be due to the fact that the FTA is relatively small, and the effects of price competition are also relatively low. It is plausible that in a larger FTA, price competition effects could potentially outweigh the gains from incomplete tariff pass through.

Second, countries that are *not* part of an existing FTA should experience the same different pre-tariff prices effects whether they negotiate bilateral FTAs with every member state, or simply join the FTA. Given that ASEAN had previously established a free trade agreement prior to ACFTA, Chinese firms already faced price competition when exporting to countries in the region. The marginal effect of accession and bilateral FTAs on pre-tariff prices would have been limited to incomplete tariff pass through. Therefore, even though China's approach to cooperation differs from countries such as the United States (which conducts trade negotiations with ASEAN nations on a bilateral basis), it should theoretically lead to the same pre-tariff prices effects. It would be worthwhile in future studies to look at alternative models of FTAs, and test if these predictions apply in other contexts.

Although this thesis makes an important contribution to our understanding of price effects, the analysis does not fully explain the extent of how FTAs affect prices. First, the treatment group in this case study was limited to agricultural commodities under the EHP. It is possible that agricultural exports are characterized by a lower degree of product differentiation, which leads to greater price competition. In contrast, it is possible that other types of products may exhibit greater heterogeneity, and therefore will not be subject to significant price competition. As such, the price effects found in this paper may not be similarly observable in non-agricultural commodities. To account for this limitation, future research could focus on "Normal" track exports under ACFTA, for which tariff elimination took place after 2005. This would provide further corroborating evidence that incomplete tariff pass through and price competition apply to a broader range of exports.

Second, it is possible that full effects only materialize some time after tariff reductions due to price stickiness. The approach taken in this thesis does not consider the lagged effects of ACFTA on pre-tariff prices, and this is due to the confounding effects of tariff reductions on non-EHP exports after July 2005. As such, the quasi-experimental set-up of this case study does not permit a fair comparison of export prices before and after 2005. It will be worthwhile to identify another case study in which the lagged effects of FTAs can be observed more closely, so as to arrive at a precise estimates of incomplete tariff pass through and price competition.

Third, this case study looks at price effects at a very macroscopic level, and does not take into account how demand and supply elasticity affect the magnitude of these effects. The empirical results do show that the cumulative effects of incomplete tariff pass-through and price competition were different in magnitudes across member countries, even though they experienced the same tariff reductions. The asymmetry could be due to unobserved variables, but it could also suggest that FTA expansion alters trade patterns even within member states. This could motivate new areas of research on trade creation and trade diversion *within* a trade bloc after the accession of new member states.

To conclude, the case study of ACFTA tells us much about how free trade agreements can have profound effects on export prices, due to profit maximization by individual firms, as well as how they respond to competition. We cannot yet conclude if ACFTA has been a bane or boon for ASEAN based on price effects alone, but it gives us a better understanding of the heterogeneity between outcomes for the Philippines relative to its neighbors in the region, as well as heterogeneity between exports from different industries. This case study provides evidence that tariff reductions have multifaceted consequences, affecting not only post-tariff prices, but pre-tariff prices as well. The presence of multiple price mechanisms suggests there is a complex interplay of forces that do not always have the same effect on the incentives of economic agents. Understanding the differences between each price effect can therefore help countries design policies to best maximize their gains from cooperation.

Appendices

Appendix A: Isolating Price Effects Using the Theoretical Model

The regression specifications used in this thesis isolate the coefficients η_1 and δ_1^* from Equation (13) by embedding multiple sub-treatment and sub-control groups within a differences-in-differences framework. This approach exploits differences in treatment effects across markets, periods and export sub-categories.

Step I: Comparison between exports sold in different markets (China vs. ROW)

China: $$\ln p_1 = A + \eta_1 \ln \tau_1 + \beta_1 \ln(\frac{w}{e_1}) + \delta_1^* \ln(\frac{w^*}{e_1^*}) + \lambda_1 \ln I + \mu_1 \ln Y \quad (21)$$

World: $$\ln p_2 = B + \eta_2 \ln \tau_2 + \beta_2 \ln(\frac{w}{e_2}) + \lambda_2 \ln I + \mu_2 \ln Y \quad (22)$$

Subtracting (22) from (21),

$$\ln\left(\frac{p_1}{p_2}\right) = C + \eta_1 \ln \tau_1 + \beta_1 \ln\left(\frac{w}{e_1}\right) - \eta_2 \ln \tau_2 - \beta_2 \ln\left(\frac{w}{e_2}\right) +$$
$$\delta_1^* \ln\left(\frac{w^* \tau_1^*}{e_1^*}\right) + \lambda_1 \ln(I_1) - \lambda_2 \ln(I_2) + \mu_1 \ln(Y_1) - \mu_2 \ln(Y_2) \quad (23)$$

The assumption that changes in unit costs have the same price effects on exports to China and ROW ($\beta_1 = \beta_2$) allows us to drop unit cost variable from (23).

$$\ln\left(\frac{p_1}{p_2}\right) = C + \eta_1 \ln \tau_1 + \beta_1 \ln\left(\frac{1}{e_1}\right) - \eta_2 \ln \tau_2 - \beta_2 \ln\left(\frac{1}{e_2}\right) +$$
$$\delta_1^* \ln\left(\frac{w^* \tau_1^*}{e_1^*}\right) + \lambda_1 \ln(I_1) - \lambda_2 \ln(I_2) + \mu_1 \ln(Y_1) - \mu_2 \ln(Y_2) \quad (24)$$

Step II: Within-country comparison between EHP and non-EHP exports

Next, we compare between EHP and non-EHP exports, whose price changes were aggregated under Equation (24).

EHP:
$$\ln\left(\frac{p_1}{p_2}\right) = A + \eta_1 \ln \tau_1 + \beta_1 \ln\left(\frac{1}{e_1}\right) - \eta_2 \ln \tau_2 - \beta_2 \ln\left(\frac{1}{e_2}\right) + \delta_1^* \ln\left(\frac{w^* \tau_1^*}{e_1^*}\right) + \lambda_1 \ln(I_1) - \lambda_2 \ln(I_2) + \mu_1 \ln(Y_1) - \mu_2 \ln(Y_2) \quad (25)$$

Since non-EHP exportss are not covered by tariff reductions under ACFTA, that term in τ_1^* drops out.

Non-EHP:
$$\ln\left(\frac{p_1^*}{p_2^*}\right) = B + \beta_1^* \ln\left(\frac{1}{e_1^*}\right) - \eta_2^* \ln \tau_2^* - \beta_2^* \ln\left(\frac{1}{e_2^*}\right) + \delta_1 \ln\left(\frac{w\tau_1}{e_1}\right) + \lambda_1^* \ln(I_1) - \lambda_2^* \ln(I_2) + \mu_1^* \ln(Y_1) - \mu_2^* \ln(Y_2) \quad (26)$$

Subtracting (26) from (25),

$$\ln\left(\frac{p_1}{p_2}\right) - \ln\left(\frac{p_1^*}{p_1^*}\right) = C + [\eta_1 \ln \tau_1] - [\eta_2 \ln \tau_2 - \eta_2^* \ln \tau_2^*] + \left[\beta_1 \ln\left(\frac{\tau_1}{e_1}\right) - \beta_1' \ln\left(\frac{\tau_1^*}{e_1^*}\right)\right] - \left[\beta_2 \ln\left(\frac{1}{e_2}\right) - \beta_2^* \ln\left(\frac{1}{e_2^*}\right)\right] + \delta_1^* \ln\left(\frac{w^* \tau_1^*}{e_1^*}\right) + [\lambda_1 \ln(I_1) - \lambda_2 \ln(I_2) + \mu_1 \ln(Y_1) - \mu_2 \ln(Y_2)] - [\lambda_1^* \ln(I_1) + \lambda_2^* \ln(I_2) - \mu_1^* \ln(Y_1) + \mu_2^* \ln(Y_2)] \quad (27)$$

Assuming that changes in aggregate price level and national output have the same effects across exports regardless of EHP status (i.e. $\lambda=\lambda^*$ and $\mu=\mu^*$) allows us to drop terms in I and Y from (27). Since there is no significant difference in overall tariff rates on exports to ROW, terms in τ_2^* cancel out. Furthermore, since we are comparing exports from the same country, they are scaled using the same exchange rates, so terms in e_1 and e_2 cancel out. Equation (28) brings us much closer to isolating each price effect.

$$\ln\left(\frac{p_1}{p_2}\right) - \ln\left(\frac{p_1^*}{p_2^*}\right) = C + [\eta_1 \ln \tau_1] + \delta_1^* \ln\left(\frac{w^* \tau_1^*}{e_1^*}\right) \quad (28)$$

Step III: Within-country comparison between monopoly and non-monopoly EHP exports

Next, we compare between monopoly and non-monopoly exports, whose price differences were aggregated under Equation (28).

EHP Non-Monopoly: $$\ln\left(\frac{p_1}{p_2}\right) - \ln\left(\frac{p_1^*}{p_2^*}\right) = A + [\eta_1 \ln \tau_1] + \delta_1^* \ln\left(\frac{w^*\tau_1^*}{e_1^*}\right) \quad (29)$$

Since monopoly exports are not exported by rival firms, the term in $\frac{w^*\tau_1^*}{e_1^*}$ drops out from Equation (28).

EHP Monopoly: $$\ln\left(\frac{p_1'}{p_2'}\right) - \ln\left(\frac{p_1^{*\prime}}{p_2^{*\prime}}\right) = B + [\eta_1' \ln \tau_1'] \quad (30)$$

Subtracting (30) from (29), we are able to isolate the treatment effect of price competition, which is represented by the coefficient δ_1^*.

$$\ln\left(\frac{\frac{p_1}{p_2}}{\frac{p_1^*}{p_2^*}}\right) - \ln\left(\frac{\frac{p_1'}{p_2'}}{\frac{p_1^{*\prime}}{p_2^{*\prime}}}\right) = C + \delta_1^* \ln\left(\frac{w^*\tau_1^*}{e_1^*}\right) \quad (31)$$

Step IV: Within-country comparison between monopoly EHP exports initially at zero tariff and monopoly EHP exports initially above zero tariff

Monopoly exports initially at zero tariff experience neither price competition nor incomplete tariff-pass through since they do not experience further tariff reductions under ACFTA. This allows us to drop term in τ_1.

EHP Monopoly, Initial Zero-Tariff: $$\ln\left(\frac{\widehat{p_1}}{\widehat{p_2}}\right) - \ln\left(\frac{\widehat{p_1^*}}{\widehat{p_2^*}}\right) = B \quad (32)$$

Subtracting (32) from (30), we are able to isolate the treatment effect of incomplete tariff pass-through, which is represented by the coefficient η_1' .

$$\ln\left(\frac{\frac{p_1'}{p_2'}}{\frac{p_1'}{p_2'}}\right) - \ln\left(\frac{\frac{\widehat{p_1}}{\widehat{p_2}}}{\frac{\widehat{p_1^*}}{\widehat{p_2^*}}}\right) = C + [\eta_1' \ln \tau_1']$$

Appendix 2

Triple Differences: EHP Member vs. EHP Non-Member,
(further controlling for non-EHP Member vs. non-EHP Non-Member)

	(6a) Indonesia v Philippines	(6b) Malaysia v Philippines	(6c) Singapore v Philippines	(6d) Thailand v Philippines
Post	-0.0445	-0.0421	-0.0360	-0.0543
	(0.116)	(0.117)	(0.119)	(0.120)
EHP	-0.583***	-0.582***	-0.593***	-0.539***
	(0.114)	(0.114)	(0.132)	(0.115)
*EHP*Post*	-0.153	-0.155	-0.158	-0.135
	(0.125)	(0.125)	(0.126)	(0.129)
Member	0.125	0.296***	0.483***	0.149
	(0.0838)	(0.0793)	(0.101)	(0.132)
*Member*Post*	-0.0369	-0.0967	-0.150	0.0523
	(0.138)	(0.123)	(0.152)	(0.182)
*EHP*Member*	0.0780	0.594***	-0.00975	0.0420
	(0.182)	(0.138)	(0.252)	(0.163)
*EHP*Member*Post*	0.308*	0.615**	0.485***	0.483**

	(0.172)	(0.268)	(0.157)	(0.218)
Observations	448	448	448	448
R-squared	0.861	0.885	0.863	0.865

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows compares the effects of ACFTA on prices of EHP exports in member countries, relative to non-member countries.

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